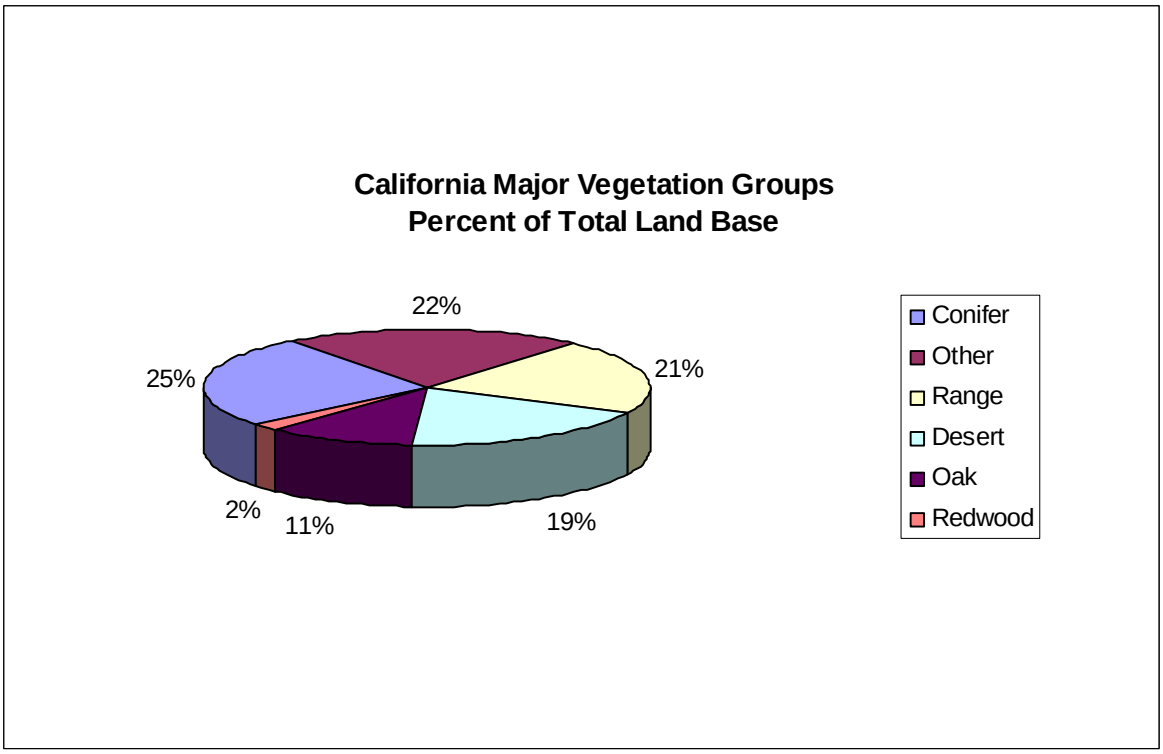
State Conditions Highlights for California 2004

California Forests **General Forest Conditions**	**Featured Summaries** **California Land Cover Monitoring** **Forest Types** **Forest Acreage** **Forest Volumes** **California Risk Map** **Stand Density Index** **Forest Conditions in California and Featured Pests** **Related Links**
Aerial Survey **Overview Surveys** **Southern California** **Sudden Oak Death**	
Abiotic Conditions and Damage **Precipitation** **Fire**	
Featured Pests, Biotic Damage **Phytophthora ramorum** **Orthotomicus erosus** **Cronartium ribicola**	

General Forest Conditions

The USDA Forest Service, Pacific Southwest Region regularly maps, measures, monitors and assesses California's forested lands. Forest Inventory and Analysis, Forest Health Monitoring and Forest Health Protection groups measure a statewide grid of permanent plots and various remotely sensed data for current forest condition, trend information and analysis. Additionally, the USFS and California Department of Forestry and Fire Protection (CDF) work cooperatively on the Land Cover Mapping and Monitoring Program to map vegetation and land cover changes, including detection of both increases and decreases in vegetative cover. http://www.fs.fed.us/r5/spf/

California has a land base of approximately 101 million acres occupied by six major vegetation types.



Nearly all of the six major vegetation types are susceptible to a variety of forest pests depending largely on tree species composition, tree stocking and other environmental factors. California's forests are among the most complex and diverse in the nation. Table 1 below displays the number of acres for major or the most common forests types occurring on 31 million acres of forested land throughout the state.

Table 1. Acres by Forest Type

Eucalyptus	11,080
Aspen	40,337
Unknown Conifer Type	107,019
Valley Oak Woodland	136,765
Valley Foothill Riparian	147,596
Closed-Cone Pine-Cypress	155,649
Montane Riparian	211,493
Jeffrey Pine	568,740
Lodgepole Pine	590,639
Subalpine Conifer	642,163
White Fir	826,162
Ponderosa Pine	906,919
Blue Oak-Foothill Pine	978,545
Juniper	1,017,385
Coastal Oak Woodland	1,094,215
Redwood	1,297,748
Pinyon-Juniper	1,349,013
Klamath Mixed Conifer	1,381,453
Red Fir	1,414,725
Eastside Pine	1,419,388
Montane Hardwood-Conifer	1,623,364
Blue Oak Woodland	2,816,250

Douglas-Fir	3,336,153
Montane Hardwood	4,439,723
Sierran Mixed Conifer	4,735,256
TOTAL FOREST	31,247,781

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National Forest System Land Area and Timberland in California

In terms of gross acreage, California contains more acreage of National Forest land than any other state. In terms of net acreage, excluding private in-holdings, California National Forest acreage is second only to Alaska by a difference of only 1.2 million acres. http://www.fs.fed.us/land/staff/lar/

Gross and Net National Forest Acreage in California:

National Forests in California	Gross Acres	Net Acres
Total Acres	24,359,118	21,973,662

Productive timberland within California's National Forests as of the last update to the Western Core Tables (December 2004) http://www.fs.fed.us/r5/rsl/publications/westcore/, are listed below. Timberland availability and suitability is reported. It's important to recognize that volumes and acreage are dynamic in terms of annual growth, mortality and periodic changes to land classification under each National Forest Plan.

Area of Available Productive Forest Land and Timberland Suitability for Region 5 National Forests:

Available Acres	Unsuitable Acres	Tentatively Suitable Acres	Not Suitable/Not Appropriate	Total Suitable
9,227,794	914,656	8,313,141	5,658,299	2,654,845

Note: Unsuitable Acres - Forested land physically unsuitable for timber production; irreversible damage likely to occur, not restockable within 5 years, or inadequate information; Not suitable / Not appropriate Acres - Forested land not appropriate for timber production (as assigned to other resource uses to meet Plan objectives); Suitable - productive and available forest land, not defined as "unsuitable" or "not appropriate".

Volume on Available Productive Forest Land for Region 5 National Forests:

Region 5	Cubic Volume in MMCF	Board Foot Volume in MMBF
Total	35,284	189,730

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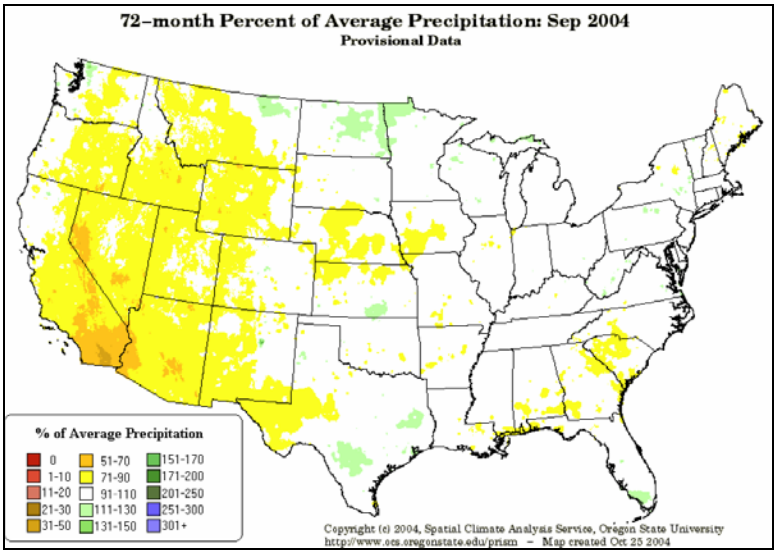
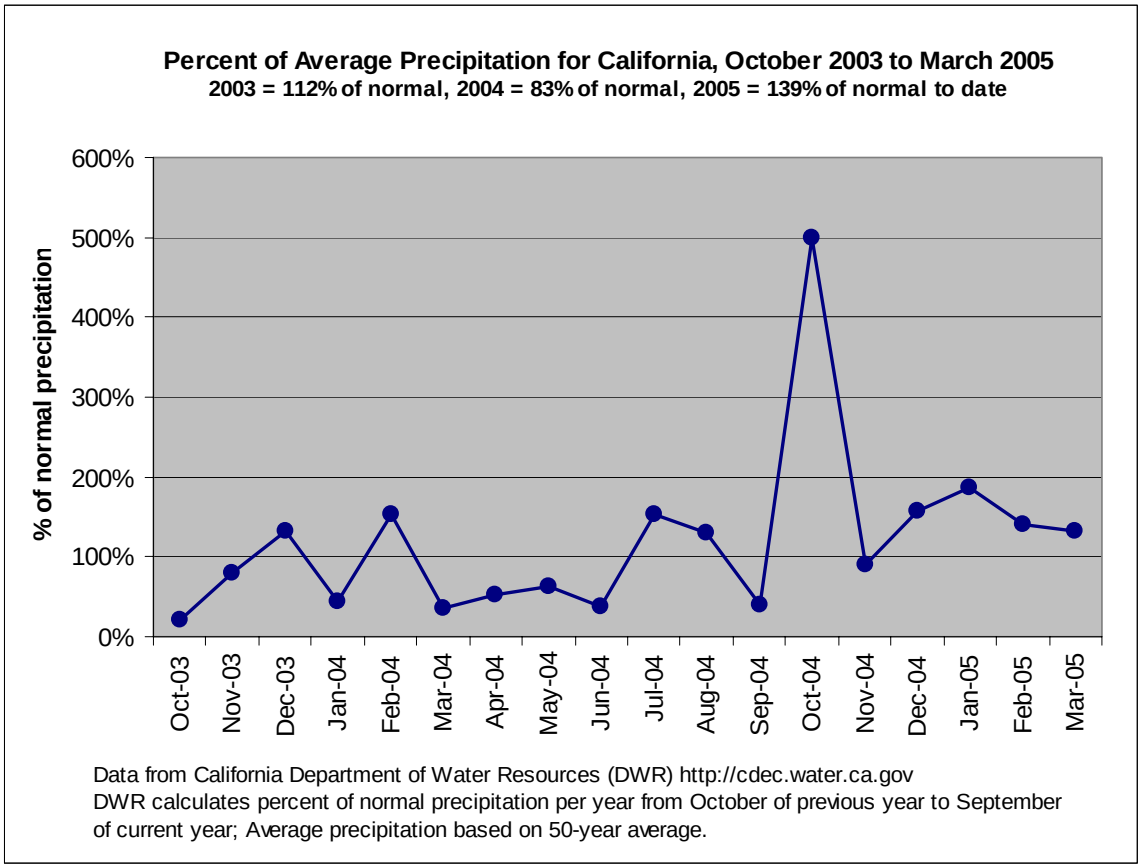
Precipitation

Precipitation is one environmental factor affecting forest health that in California can have dramatic effects. It's important to recognize the diversity of forest pests and the wide variety of environmental conditions affecting them. Certain pathogens may respond well to wetter periods, such as *Phytophthora ramorum*, responsible for Sudden Oak Death. Other insect pests can complete multiple life cycles during dryer, warmer periods such as *Ips paraconfusus* which can reach outbreak conditions lasting two to three years during extended periods of drought. Other significant factors that contribute to forest decline include multiple environmental and forest structural factors, such as drought and above average stand densities along with different tree and pest species. Precipitation and deviation from average varies throughout the

state. During the last six years, most of the state experienced drought conditions ranging from 71-90% of average through central and northeastern California and 31-70% of normal in southern California.



Statewide average precipitation for 2004 is 83% of normal. Southern California rainfall remained just below the 20-year average for that portion of the state and increased dramatically from late summer to the end of the year (see Aerial Survey section displaying tree mortality and rainfall).



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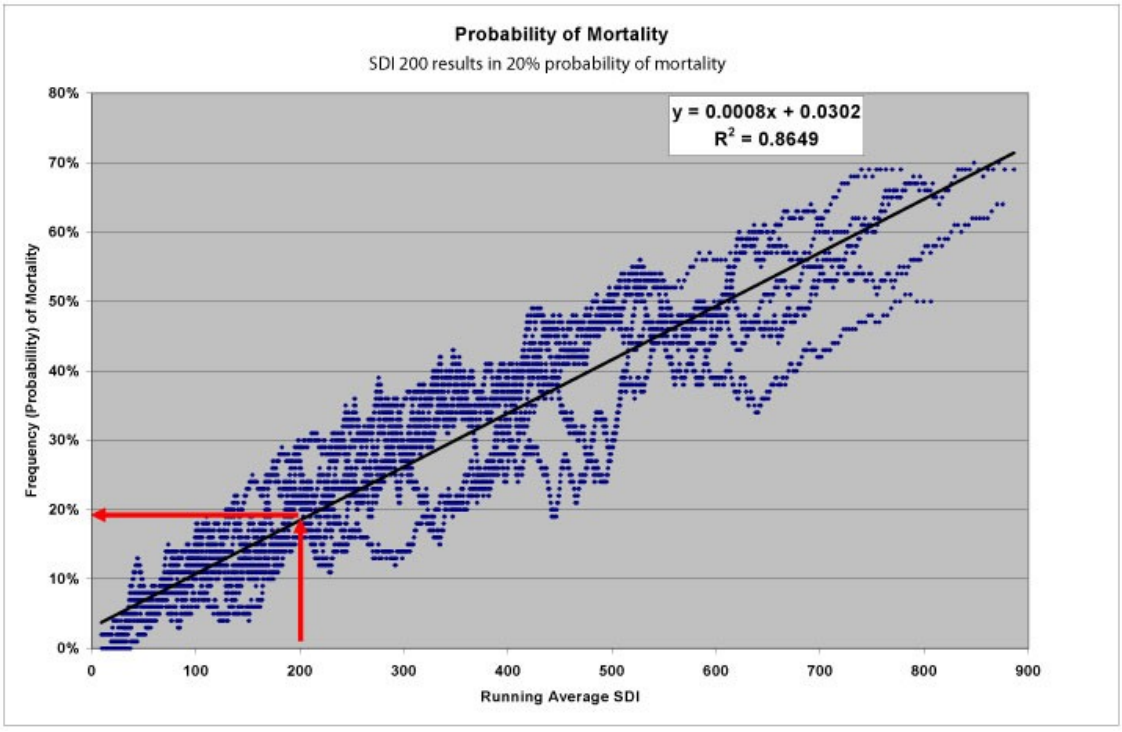
Stand Density

Another significant factor that contributes to forest decline is inter-tree competition. Especially during periods of drought, high stocking levels predispose trees to insect and/or pathogen-related mortality. In other periods, low levels of tree mortality commonly occur and are, seemingly, inevitable. Dead standing and fallen trees provide habitat for wildlife and fallen trees contribute to soil productivity. When high mortality levels occur, these trees may become hazards to public safety and/or key infrastructure, for example, buildings and roads. Additionally, the accumulation of dead standing and fallen trees increases fuel hazards. On July 14, 2004, Regional Forester Jack Blackwell issued direction to routinely consider a full set of objectives, including density reduction, to lower the risk of unacceptable levels of tree mortality. link to Density_mgmt_policy_7_2004.doc

Stand density index (SDI) values provide a measure of stocking, against which existing levels can be assessed. Maximum SDI values have been estimated for many forest tree species. In some cases, research provides threshold values, which, when exceeded, lead to increases in the mortality rate. Additionally, multiple studies provide evidence that lower SDI values are linked to lower mortality rates. The graph below displays mortality levels over SDI values for a combination of 6 major tree species groupings in California, including red fir, white fir, mixed conifer-fir, mixed conifer-pine, Douglas-fir and eastside pine. The data is from a collection of routine inventories gathered over, approximately, the last 15 years and includes mortality from all damage agents, biotic and abiotic. As presented, a threshold is not evident; however, a relationship between increasing mortality and increasing SDI values appears clear. Based on this data, an SDI level of 200 is associated with a 20% mortality probability. For more information on SDI and other forest conditions, see California Forest Pest Council, 53rd Annual Meeting Presentations http://www.caforestpestcouncil.org



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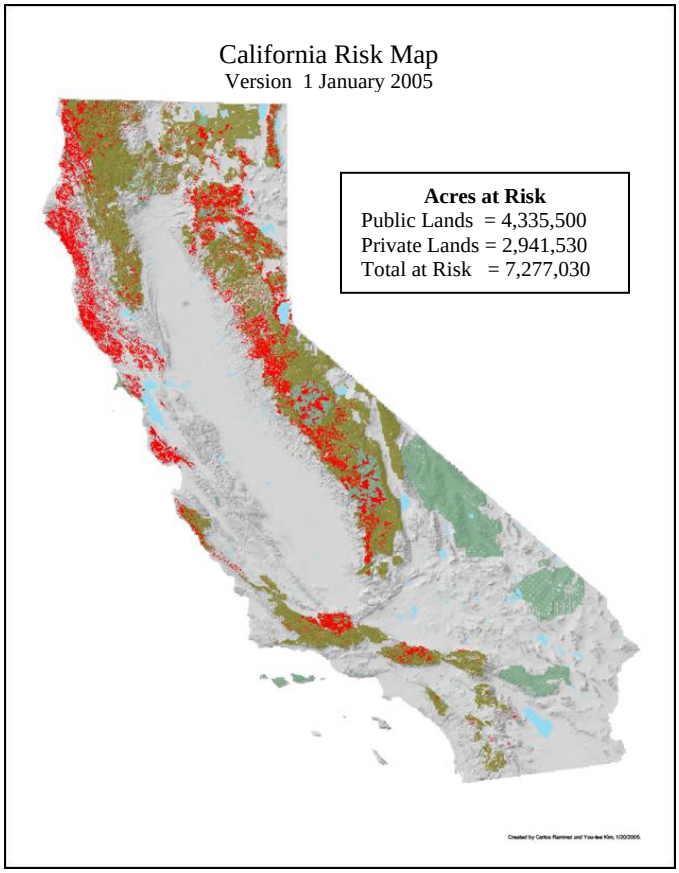
Risk of Insect and Disease, California Risk Map

Scientific literature, professional knowledge, and existing statistical data were used to develop models for mapping risk. Risk mortality maps are based upon rules and statistics developed for the National forests and surrounding forested areas. Rule structures for most forests are based primarily upon stand density index (SDI) and also include precipitation, plantation information, elevation, and canopy cover by host type. SDI numbers are developed on a forest-by-forest basis based on the forests integrated inventory data. SDI numbers were averaged for each strata which aggregates statistically similar vegetation structure classes and is cross-walked to vegetation layers for use in model development. Strata are used to assign SDI and basal area values. Vegetation data is synchronous with respect to inventory, vegetation maps, and strata map labels, and are used to assign host type and canopy cover information. The models are run using specific rule-sets developed for each forest by each forest and extended to non-NFS lands.

Areas at risk of mortality are indicated in red where the model projects 25% tree volume loss during the next 15 years. The model results displayed in the map are reduced from the previous version where mortality predictions were made in southern California and recently occurred. Areas once mapped as "red" on and near the San Bernardino and Cleveland National Forests have now been removed in the aftermath of the mortality event reducing live tree stocking to levels considered below risk. In many situations, these areas are now converted over to hardwood species that happened to survive or in some cases bare ground where nearly all susceptible conifers have died.



Note: Acres at risk include approximately 20,000 acres outside of California but within the Lake Tahoe Basin

Models are currently being reviewed to meet National standards for a 2006 version of pest risk nationwide.

Specific risk models are available at http://www.fs.fed.us/r5/spf/about/riskmapping-overview.shtml

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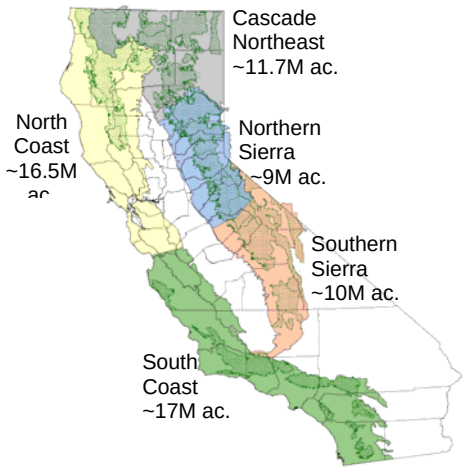
California Land Cover Monitoring Program



Remotely sensed data and GIS (geographic information systems) are used to generate data that describe the extent and condition of various land cover types, and the magnitude and cause (e.g., urbanization, natural succession, wildfire, and timber harvest) of land cover changes. The data developed from this program provides a single, consistent source of current land cover data from which the FS as well as other interested federal, state and local governments and private citizens can make informed resource management decisions.

In 2004 the second cycle of the Northern Sierra project area was completed. A published report is available for downloading http://www.fs.fed.us/r5/spf/publications/fhp-proj-reports.shtml.

Change classes for LCMMP monitoring data are based on change in cover (CC). For hardwood, shrub/chaparral and conifer cover loss, change classes are broken down into three categories: –71 to –100% CC (71 to 100% decrease in cover), –41 to –70% CC and –16 to –40% CC. For hardwood, shrub/chaparral and conifer cover gain, change classes are broken down into two categories: +16 to +40% CC and +41 to +100% CC. In the grass and forb vegetation types, the change classes are quantified as a decrease or increase in vegetation cover of 16% or greater. The cause of change is also determined when possible. Monitoring data for this project area have an overall accuracy of 82.3%.

Highlights from the Northern Sierra Project Area:

Decreases across all vegetation types occur on approximately 175,200 acres (2% of the project area). Increases occur on about 49,700 acres (1% of the project area).

Decreases in conifer account for about 129,500 acres of the total decrease

in vegetation within the project area.

- Hardwood and shrub/chaparral show a decrease on about 29,900 acres and 14,000 acres, respectively.
- Fire is the primary cause of change in both the conifer and the hardwood vegetation types, affecting about 65,600 acres and 21,900 acres, respectively.
- Harvest is a major cause of change within conifer types, accounting for approximately 29,200 acres of the total decrease.

Increases in conifer account for nearly 40,000 acres of the total increase in vegetation in the project area.

- Shrub/chaparral shows an increase on about 5,700 acres.
- Regrowth is the primary cause for increase in both conifer and shrub/chaparral types, affecting about 26,600 acres and 4,200 acres, respectively.
- Cause of change is unverified on more than one-quarter of the increase in both the conifer and the shrub/chaparral types.

In 2005 the Southern Sierra Project area and Southern California Project area will be completed.

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Forest Conditions in California and Pests of Interest

This section focuses primarily on pest-related conditions. For information specific to fire, go to http://www.fs.fed.us/r5/fire/ and http://www.fire.ca.gov/cdf/incidents/

Information gathered during aerial surveys, projections for unsurveyed areas and estimates based in historic trends were compiled to summarize acres of damage by some of California's major pests. The Forest Pest Information System, table 2, displays acreage estimates by land ownership and conifer volume loss in millions of cubic feet (MCF).

Table 2. Acres of Pest Damage and Volume Loss by Ownership for 2004

Pest	Land Ownership	Acres Infested (in 1000s)	Volume Loss (MCF)
Mountain Pine Beetle	National Forest	246.1	75,00.4
	Other Federal	46.5	14,266.5
	State & Private	145.5	44,645.3
Other Insects	National Forest	984.4	302,001.8
	Other Federal	186.0	57,066.0
	State & Private	582.1	178,581.2
Root Diseases*	National Forest	1,015.0	15.0
	Other Federal	46.0	0.5
	State & Private	950.0	10.0
Dwarf Mistletoe*	National Forest	2,283.0	102.0
	Other Federal	69.0	4.0
	State & Private	1,911.0	84.0

* infested acres with volume loss, not necessarily whole-tree mortality for these pests

Mediterranean Pine Engraver Beetle, *Orthotomicus erosus*

A new non-native, exotic insect pest was detected in California for the first time during 2004 in the Fresno area. The beetle is native to Africa, Asia and Europe, affects many pine species, behaves similarly to *Ips* engraver beetles well established in California. The Mediterranean pine engraver beetle is considered by California Department of Food and Agriculture to be well established and have determined "non-actionable" however other agencies are currently considering containment and control measures. Possible impacts include populations moving into Monterey pine habitats and interacting with pitch canker, some pine species planted in the central valley may be susceptible, Aleppo pine is a native host for the beetle and presumably moderately susceptible in California. http://spfnic.fs.fed.us/exfor/

White Pine Blister Rust, *Cronartium ribicola*

White pine blister rust, an invasive pathogen, is known to affect sugar pine and western white pine, two of several white pine species in California and primary tree hosts for disease. Impacts on sugar pine and western white pine are well known, damage is widespread and common in California. It is among the most damaging diseases of pines. Resistant sugar pine are often identified and protected in the forest as seed source for growing resistant nursery stock. Other tree hosts, or potential hosts, are great basin bristlecone, foxtail, limber and whitebark pines. Less is known about disease's impacts on these other white pines. In 2004, a two-year field project was initiated by the USDA Forest Service to learn more about impacts to California's other white pines. Others working on the project include Death Valley National Park and a consulting pathologist. Thus far, great basin bristlecone pine is the only white pine species not affected. Preliminary data indicate that the incidence of rust in northern populations of foxtail pine is between 18-30%. The study did not observe blister rust on any limber pine plots. Rust incidence varied widely in whitebark pine (8-71% in the infected plots) and tended toward the northern portion of the reconnaissance area which extends from Lake Tahoe to Yosemite National Park. Greater coverage is expected in 2005 and results of the study will lead to greater understanding of white pine conservation and management.

Pest-related damage to white pines observed from aerial surveys conducted from 1999 through 2004 indicated approximately 35,320 acres in combination of topkill, defoliation and whole-tree mortality. Though at a very course scale, the results indicate damage to whitebark, western white and sugar pine on nearly every National Forest. Other white pine species were not specifically identified during aerial surveys. Based on aerial observations alone, the specific damage agent is uncertain and could have been caused by a variety of biotic damage agents, insects or disease. The greatest amount of damage was mapped on the Sequoia and Sierra National Forests during the last six years. Not included in this summary is mixed conifer damage, which likely includes a small proportion of white pine species, primarily sugar pine, see table 3.

Table 3. White Pine Damage Acres from Aerial Surveys Conducted 1999-2004

Year of Survey, Species & Damage Type	1999 Whitebark Mortality	2000 Western White Defoliation	2002 Sugar Mortality	2003 Sugar Mortality	2004 Sugar Topkill	2004 Sugar Mortality	Total Acres
Total Acres	550	2,100	240	4,680	1,170	26,580	35,320

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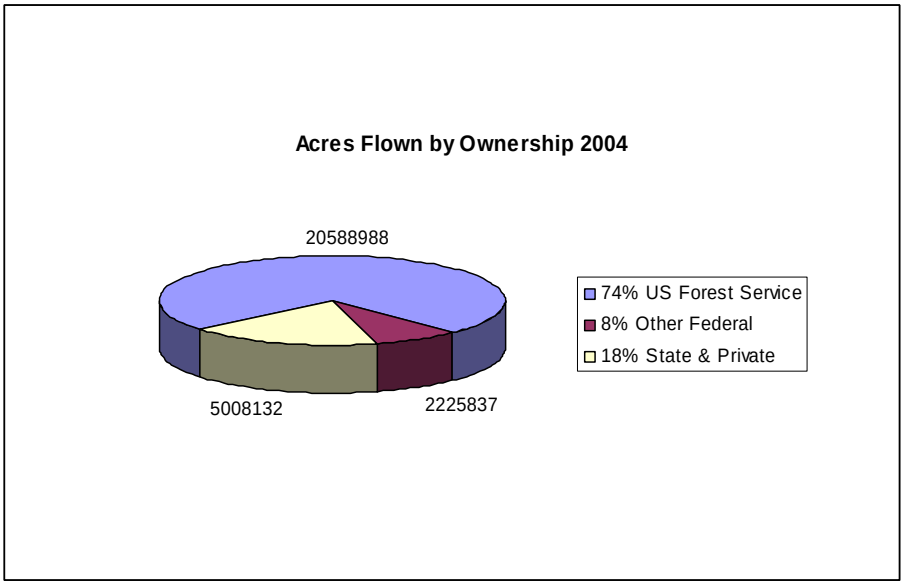
Aerial Surveys – Regionwide Overview Surveys, National Annual Program

Areas flown in California included approximately 27 million acres predominantly on federal lands but also a large percentage of state and private ownership. Approximately 21 million acres of USDA Forest

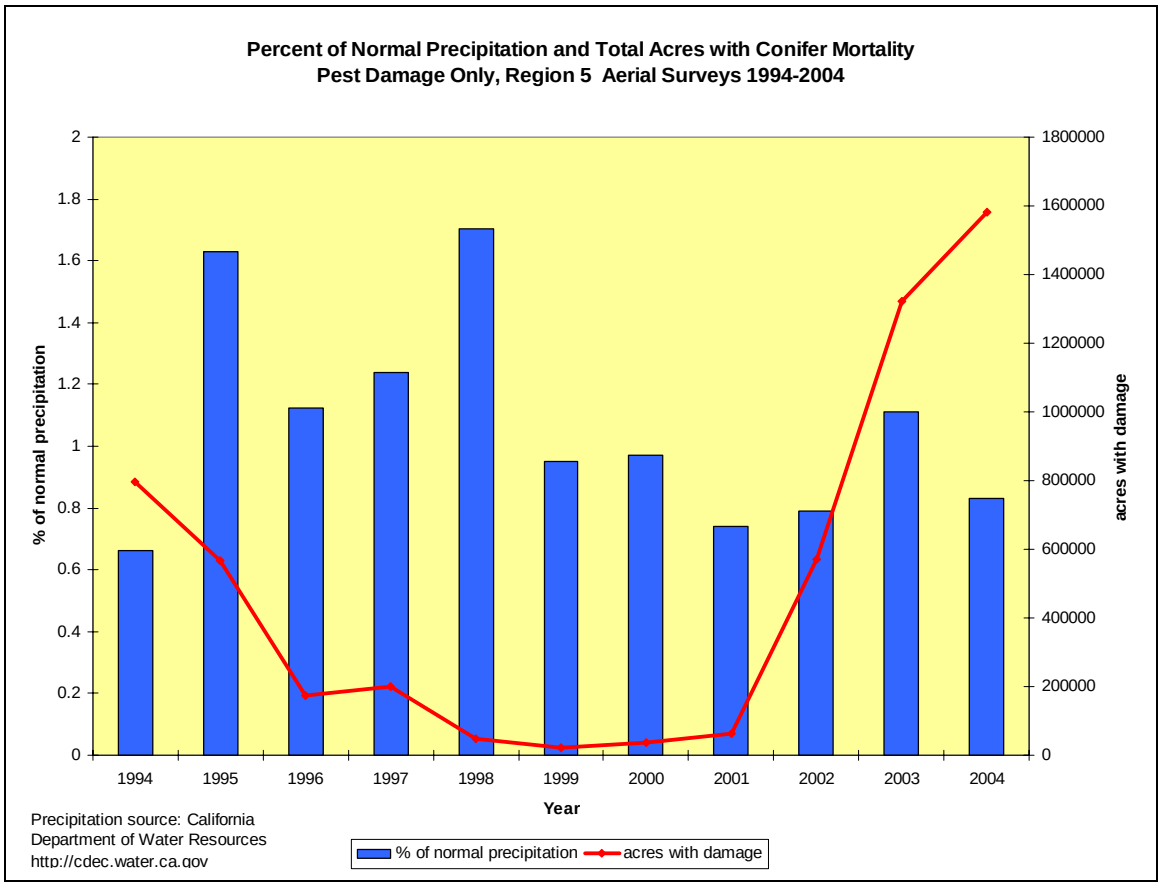
Service, 5 million acres of state and private and 2 million acres of other federal lands were surveyed. Other federal includes primarily National Park acreage and to a lesser degree Bureau of Indian Affairs, US Fish and Wildlife, and Bureau of Reclamation (in descending order). State and private includes primarily private property and to a lesser degree Parks and Recreation, City/County, Fish and Game, State Land Commission, State Forestry, Audobon, Nature Conservancy and State University.



Approximately 9 million forested acres within California were not flown as part of the annual survey program. These areas are mostly coastal and/or do not experience the elevated degree of pest damage that the remainder of the state does. However, much of the 9 million-acre area not flown was surveyed during the special survey for Sudden Oak Death.

Pest-caused mortality, Sequoia NF

The graph below displays the trend in pest-related conifer mortality relative to statewide average precipitation for all National Forests and National Parks surveyed during the last 10 years. As noted above, the results of these surveys are primarily for National Forest lands but also include varying amounts of interior and adjacent state, private and other federal ownerships.



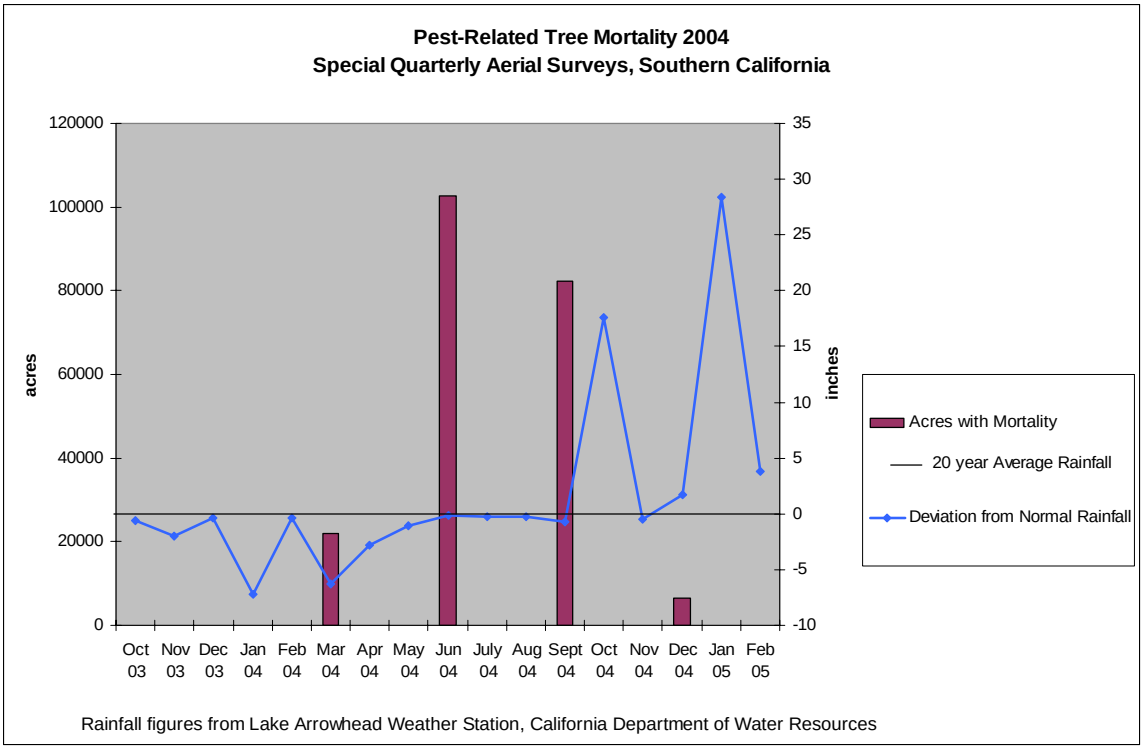
Note: Aerial surveys are valuable as a method to gain broad-scale information on forest health trends and not intended to replace more specific, on-the-ground information.

Southern California – Special Aerial Surveys

Southern California has recently suffered an ecosystem-altering effect involving tremendous tree mortality. Some areas experienced relatively lower levels of mortality while others suffered large areas of contiguous mortality, primarily in conifer species. Where conifers once dominated and hardwoods survived, the result is a major shift in tree species composition, an extreme build up of fuels and hazard to public safety, and ecosystem impacts including impacts to the flora and fauna upon which they rely.

Insect activity and tree mortality seams to have peaked in 2003, beetle populations and tree mortality are down for 2004. Pest-related mortality mapped on the San Bernardino National Forest dropped from 500,000 acres in 2003 to 33,000 acres in 2004. For full report on quarterly aerial surveys conducted during 2004 (link to socal_update_dec04.doc)

The graph displays results of the quarterly surveys relative to precipitation during the same period and also state average precipition which indicates a dramatic shift to above-normal precipitation toward the end of 2004.



Aerial survey data aided prioritization of treatments and distribution of funding to help with hazard and fuel reduction, utilization of material and restoration. Treatments were prioritized along transportation systems, near residences, Southern California Edison transmission lines, and the Wildland Urban Interface (WUI) in general. Treatment acres displayed in the table 4 are mostly high priority.

Table 4. Treatment Acres Prioritized by County

Acres Prioritized for Treatment	County
70,766	San Bernardino
32,878	San Diego
27,590	Riverside

Hazard tree removal in proximity to homes and roads,

Lake Arrowhead

Harvest activities to reduce fuel and fire hazard in the WUI, Tunnel Ridge San Bernardino NF

WUI treatments near Cedar Pines, San Bernardino NF

For more information on treatment progress and what is planned in the future, see California Forest Pest Council, 53rd Annual Meeting Presentations: Southern CA Die Off – Status and update on Treatment Progress at http://www.caforestpestcouncil.org/2004_CFPC_Annual_Mtg_53rd.htm

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Sudden Oak Death – Special Aerial Surveys

Coast live oak killed by *P.ramorum*

Since 2001, USDA Forest Service and California Polytechnic State University, San Luis Obispo have been collaborating for early detection and monitoring of the occurrence of *Phytophthora ramorum*, the pathogen known to cause Sudden Oak Death (SOD). The effort consists of annual aerial surveys to map hardwood mortality in overstory tree species including coast live oak (*Quercus agrifolia*), tanoak (*Lithocarpus densiflorus*), Shreve oak

(*Quercus parvula var shrevei*) and California black oak (*Quercus kelloggii*). These aerial surveys are followed by ground surveys to locate and sample both symptomatic overstory and understory host plants. Over the past few years the surveys have focused on early detection within minimally infested counties or counties with no known occurrence of *P. ramorum* but share a common border with regulated (infested) counties. The team of cooperators includes assistance from University of California (UC), California Department of Food and Agriculture (CDFA), county agricultural commissioners and cooperation from numerous private and public entities.

Success in the program can be looked at in at least two ways, 1) by identifying new disease infestations and 2) by not finding new disease infestations. Over the past four years, the combination of aerial survey and ground confirmation efforts have identified new fronts of infection and mapped the distribution of *P. ramorum* within counties, or portions of counties, not previously known to have the disease (including recent expansion into southern Monterey County and new finds in Lake County). Ground surveys targeted by areas mapped aerially are checked for new infestations and infestations that expand the current range of *P. ramorum*. Established sampling protocols are followed to determine if *P. ramorum* symptoms are evident in any of the susceptible plant species present. All samples are shipped to the appropriate laboratory for confirmation of *P.ramorum* as well as other Phytophthoras. Results from aerial and ground surveys conducted over the last four years were compiled and evaluated for over 1,000 discrete areas mapped from the air and hundreds of sites visited on the ground showing the distribution of *P. ramorum*-caused hardwood mortality across the landscape. For a full report including results from aerial and ground surveys conducted annually since 2001, see add link to SOD_airgrdsurveyCA_scisymp2.doc

Current confirmations and infested counties within California:

During the history of aerial surveys in California, there have been several important confirmations as a result of subsequent ground checks. Significant field confirmations include:

- 2001 - Solano County collection shortly after first detection by others
- 2002 - Contra Costa County collection shortly after first detection by others
- 2003 - Monterey County collection approximately 25 miles south of previous confirmations and 10 miles from uninfested San Luis Obispo County
- 2004 - Lake County collection and the first confirmation in the county adding it to the list of regulated counties; Humboldt County collections 2 miles east and 2 miles south of previous confirmations in Redway

Sampling tan oak in Mendocino County

Aerial view of tan oak mortality Connick Creek, Humboldt County
Subsequently confirmed *P.ramorum* from ground sampling

For more information on Sudden Oak Death, go to http://suddenoakdeath.org/

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Related Links of Interest

http://suddenoakdeath.org/
http://kellylab.berkeley.edu/SODmonitoring/
http://www.caforestpestcouncil.org/
http://www.fs.fed.us/r5/rsl/
http://www.fs.fed.us/r5/rsl/
http://www.fire.ca.gov/php/
http://frap.cdf.ca.gov/
http://spfnic.fs.fed.us/exfor/